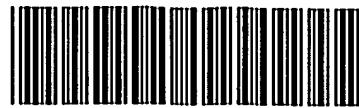


RAW SEQUENCE LISTING

The Biotechnology Systems Branch of the Scientific and Technical Information Center (STIC) no errors detected.

Application Serial Number: 10/539,891
Source: PCT
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PATENT APPLICATION: US/10/539,891

DATE: 06/29/2005

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3 <110> APPLICANT: Napier, Johnathan A.
 4 Sayanova, Olga
 5 Lazarus, Colin M.
 6 Qi, Baoxiu
 7 Heinz, Ernst
 8 Zank, Thorsten
 9 Zahringer, Ulrich
 11 <120> TITLE OF INVENTION: Novel method for the production of polyunsaturated fatty acids
 13 <130> FILE REFERENCE: 13478-00001-US
 C--> 15 <140> CURRENT APPLICATION NUMBER: US/10/539,891
 C--> 15 <141> CURRENT FILING DATE: 2005-06-17
 15 <150> PRIOR APPLICATION NUMBER: PCT/EP2003/014054
 16 <151> PRIOR FILING DATE: 2003-12-11
 18 <150> PRIOR APPLICATION NUMBER: GB 0229578.0
 19 <151> PRIOR FILING DATE: 2002-12-19
 21 <150> PRIOR APPLICATION NUMBER: GB 0316989.3
 22 <151> PRIOR FILING DATE: 2003-07-21
 24 <160> NUMBER OF SEQ ID NOS: 10
 26 <170> SOFTWARE: PatentIn version 3.3
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 29 <211> LENGTH: 1266
 30 <212> TYPE: DNA
 31 <213> ORGANISM: Euglena gracilis
 33 <220> FEATURE:
 34 <221> NAME/KEY: CDS
 35 <222> LOCATION: (1)..(1266)
 36 <223> OTHER INFORMATION: delta-8-desaturase
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 41 1 5 10 15
 43 tat gat gtg tct gcc tgg gtc aat ttc cac cct ggt ggt gcg gaa att 96
 44 Tyr Asp Val Ser Ala Trp Val Asn Phe His Pro Gly Gly Ala Glu Ile
 45 20 25 30
 47 ata gag aat tac caa gga agg gat gcc act gat gcc ttc atg gtt atg 144
 48 Ile Glu Asn Tyr Gln Gly Arg Asp Ala Thr Asp Ala Phe Met Val Met
 49 35 40 45
 51 cac tct caa gaa gcc ttc gac aag ctc aag cgc atg ccc aaa atc aat 192
 52 His Ser Gln Glu Ala Phe Asp Lys Leu Lys Arg Met Pro Lys Ile Asn
 53 50 55 60
 55 ccc agt tct gag ttg cca ccc cag gct gca gtg aat gaa gct caa gag 240
 56 Pro Ser Ser Glu Leu Pro Pro Gln Ala Ala Val Asn Glu Ala Gln Glu
 57 65 70 75 80

(pg-6)

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PATENT APPLICATION: US/10/539,891

DATE: 06/29/2005

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60	Asp	Phe	Arg	Lys	Leu	Arg	Glu	Glu	Leu	Ile	Ala	Thr	Gly	Met	Phe	Asp		
61					85				90					95				
63	gcc	tcc	ccc	ctc	tgg	tac	tca	tac	aaa	atc	agc	acc	aca	ctg	ggc	ctt	336	
64	Ala	Ser	Pro	Leu	Trp	Tyr	Ser	Tyr	Lys	Ile	Ser	Thr	Thr	Leu	Gly	Leu		
65					100				105					110				
67	gga	gtg	ctg	ggt	tat	ttc	ctg	atg	gtt	cag	tat	cag	atg	tat	ttc	att	384	
68	Gly	Val	Leu	Gly	Tyr	Phe	Leu	Met	Val	Gln	Tyr	Gln	Met	Tyr	Phe	Ile		
69					115				120				125					
71	ggg	gca	gtg	ttg	ctt	ggg	atg	cac	tat	caa	cag	atg	ggc	tgg	ctt	tct	432	
72	Gly	Ala	Val	Leu	Leu	Gly	Met	His	Tyr	Gln	Gln	Met	Gly	Trp	Leu	Ser		
73					130				135				140					
75	cat	gac	att	tgc	cac	cac	cag	act	ttc	aag	aac	ccg	aac	tgg	aac	aac	480	
76	His	Asp	Ile	Cys	His	His	Gln	Thr	Phe	Lys	Asn	Arg	Asn	Trp	Asn	Asn		
77	145				150				155				160					
79	ctc	gtg	gga	ctg	gta	ttt	ggc	aat	ggt	ctg	caa	ggt	ttt	tcc	gtg	aca	528	
80	Leu	Val	Gly	Leu	Val	Phe	Gly	Asn	Gly	Leu	Gln	Gly	Phe	Ser	Val	Thr		
81					165				170				175					
83	tgc	tgg	aag	gac	aga	cac	aat	gca	cat	cat	tcg	gca	acc	aat	gtt	caa	576	
84	Cys	Trp	Lys	Asp	Arg	His	Asn	Ala	His	His	Ser	Ala	Thr	Asn	Val	Gln		
85					180				185				190					
87	ggg	cac	gac	cct	gat	att	gac	aac	ctc	ccc	ctc	tta	gcc	tgg	tct	gag	624	
88	Gly	His	Asp	Pro	Asp	Ile	Asp	Asn	Leu	Pro	Leu	Leu	Ala	Trp	Ser	Glu		
89					195				200				205					
91	gat	gac	gtc	aca	cg	g	tca	ccg	att	tcc	cg	aag	ctc	att	cag	ttc	672	
92	Asp	Asp	Val	Thr	Arg	Ala	Ser	Pro	Ile	Ser	Arg	Lys	Leu	Ile	Gln	Phe		
93					210				215				220					
95	cag	cag	tat	tat	ttc	ttg	gtc	atc	tgt	atc	ttg	ttg	cg	ttc	att	tgg	720	
96	Gln	Gln	Tyr	Tyr	Phe	Leu	Val	Ile	Cys	Ile	Leu	Leu	Arg	Phe	Ile	Trp		
97	225				230				235				240					
99	tgt	ttc	cag	agc	gtg	ttg	acc	gtg	cgc	agt	ctg	aag	gac	aga	gat	aac	768	
100	Cys	Phe	Gln	Ser	Val	Leu	Thr	Val	Arg	Ser	Leu	Lys	Asp	Arg	Asp	Asn		
101					245				250				255					
103	caa	ttc	tat	cg	tct	cag	tat	aag	aag	gag	gcc	att	ggc	ctc	gcc	ctg	816	
104	Gln	Phe	Tyr	Arg	Ser	Gln	Tyr	Lys	Lys	Glu	Ala	Ile	Gly	Leu	Ala	Leu		
105					260				265				270					
107	cat	tgg	aca	ttg	aag	gcc	ctg	ttc	cac	tta	ttc	ttt	atg	ccc	agc	atc	864	
108	His	Trp	Thr	Leu	Lys	Ala	Leu	Phe	His	Leu	Phe	Phe	Met	Pro	Ser	Ile		
109					275				280				285					
111	ctc	aca	tcg	ctg	ttg	gta	ttt	ttc	gtt	tcg	gag	ctg	gtt	ggc	ggc	ttc	912	
112	Leu	Thr	Ser	Leu	Leu	Val	Phe	Phe	Val	Ser	Glu	Leu	Val	Gly	Gly	Phe		
113					290				295				300					
115	ggc	att	g	cg	atc	gtg	gtg	ttc	atg	aac	cac	tac	cca	ctg	gag	aag	atc	960
116	Gly	Ile	Ala	Ile	Val	Val	Phe	Met	Asn	His	Tyr	Pro	Leu	Glu	Lys	Ile		
117	305				310				315				320					
119	ggg	gac	tcg	tcg	tgg	gat	ggc	cat	gga	ttc	tcg	gtt	ggc	cag	atc	cat	1008	
120	Gly	Asp	Ser	Val	Trp	Asp	Gly	His	Gly	Phe	Ser	Val	Gly	Gln	Ile	His		
121					325				330				335					
123	gag	acc	atc	aac	att	cgg	cga	ggg	att	atc	aca	gat	tgg	ttt	ttc	gga	1056	

RAW SEQUENCE LISTING
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127 ggc ttg aac tac cag atc gag cac cat ttg tgg ccg acc ctc cct cgc 1104
128 Gly Leu Asn Tyr Gln Ile Glu His His Leu Trp Pro Thr Leu Pro Arg
129 355 360 365
131 cac aac ctg aca gcg gtt agc tac cag gtg gaa cag ctg tgc cag aag 1152
132 His Asn Leu Thr Ala Val Ser Tyr Gln Val Glu Gln Leu Cys Gln Lys
133 370 375 380
135 cac aac ctg ccg tat cgg aac ccg ctg ccc cat gaa ggg ttg gtc atc 1200
136 His Asn Leu Pro Tyr Arg Asn Pro Leu Pro His Glu Gly Leu Val Ile
137 385 390 395 400
139 ctg ctg cgc tat ctg gcg gtg ttc gcc ccg atg gcg gag aag caa ccc 1248
140 Leu Leu Arg Tyr Leu Ala Val Phe Ala Arg Met Ala Glu Lys Gln Pro
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157 Tyr Asp Val Ser Ala Trp Val Asn Phe His Pro Gly Gly Ala Glu Ile
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160 Ile Glu Asn Tyr Gln Gly Arg Asp Ala Thr Asp Ala Phe Met Val Met
161 35 40 45
163 His Ser Gln Glu Ala Phe Asp Lys Leu Lys Arg Met Pro Lys Ile Asn
164 50 55 60
166 Pro Ser Ser Glu Leu Pro Pro Gln Ala Ala Val Asn Glu Ala Gln Glu
167 65 70 75 80
169 Asp Phe Arg Lys Leu Arg Glu Glu Leu Ile Ala Thr Gly Met Phe Asp
170 85 90 95
172 Ala Ser Pro Leu Trp Tyr Ser Tyr Lys Ile Ser Thr Thr Leu Gly Leu
173 100 105 110
175 Gly Val Leu Gly Tyr Phe Leu Met Val Gln Tyr Gln Met Tyr Phe Ile
176 115 120 125
178 Gly Ala Val Leu Leu Gly Met His Tyr Gln Gln Met Gly Trp Leu Ser
179 130 135 140
181 His Asp Ile Cys His His Gln Thr Phe Lys Asn Arg Asn Trp Asn Asn
182 145 150 155 160
184 Leu Val Gly Leu Val Phe Gly Asn Gly Leu Gln Gly Phe Ser Val Thr
185 165 170 175
187 Cys Trp Lys Asp Arg His Asn Ala His His Ser Ala Thr Asn Val Gln
188 180 185 190
190 Gly His Asp Pro Asp Ile Asp Asn Leu Pro Leu Leu Ala Trp Ser Glu
191 195 200 205
193 Asp Asp Val Thr Arg Ala Ser Pro Ile Ser Arg Lys Leu Ile Gln Phe

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197	225		230		235		240										
199	Cys	Phe	Gln	Ser	Val	Leu	Thr	Val	Arg	Ser	Leu	Lys	Asp	Arg	Asp	Asn	
200					245		250		255								
202	Gln	Phe	Tyr	Arg	Ser	Gln	Tyr	Lys	Lys	Glu	Ala	Ile	Gly	Leu	Ala	Leu	
203					260		265		270								
205	His	Trp	Thr	Leu	Lys	Ala	Leu	Phe	His	Leu	Phe	Phe	Met	Pro	Ser	Ile	
206					275		280		285								
208	Leu	Thr	Ser	Leu	Leu	Val	Phe	Phe	Val	Ser	Glu	Leu	Val	Gly	Gly	Phe	
209					290		295		300								
211	Gly	Ile	Ala	Ile	Val	Val	Phe	Met	Asn	His	Tyr	Pro	Leu	Glu	Lys	Ile	
212	305				310		315		320								
214	Gly	Asp	Ser	Val	Trp	Asp	Gly	His	Gly	Phe	Ser	Val	Gly	Gln	Ile	His	
215					325		330		335								
217	Glu	Thr	Met	Asn	Ile	Arg	Arg	Gly	Ile	Ile	Thr	Asp	Trp	Phe	Phe	Gly	
218					340		345		350								
220	Gly	Leu	Asn	Tyr	Gln	Ile	Glu	His	His	Leu	Trp	Pro	Thr	Leu	Pro	Arg	
221					355		360		365								
223	His	Asn	Leu	Thr	Ala	Val	Ser	Tyr	Gln	Val	Glu	Gln	Leu	Cys	Gln	Lys	
224					370		375		380								
226	His	Asn	Leu	Pro	Tyr	Arg	Asn	Pro	Leu	Pro	His	Glu	Gly	Leu	Val	Ile	
227	385				390		395		400								
229	Leu	Leu	Arg	Tyr	Leu	Ala	Val	Phe	Ala	Arg	Met	Ala	Glu	Lys	Gln	Pro	
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248	Met	Ala	Leu	Ala	Asn	Asp	Ala	Gly	Glu	Arg	Ile	Trp	Ala	Ala	Val	Thr	
249	1		5					10				15					
251	gac	ccg	gaa	atc	ctc	att	ggc	acc	ttc	tcc	tac	ttg	cta	ctc	aaa	ccg	96
252	Asp	Pro	Glu	Ile	Leu	Ile	Gly	Thr	Phe	Ser	Tyr	Leu	Leu	Lys	Pro		
253		20			25			30									
255	ctg	ctc	cgc	aat	tcc	ggg	ctg	gtg	gat	gag	aag	aag	ggc	gca	tac	agg	144
256	Leu	Leu	Arg	Asn	Ser	Gly	Leu	Val	Asp	Glu	Lys	Lys	Gly	Ala	Tyr	Arg	
257		35			40			45									
259	acg	tcc	atg	atc	tgg	tac	aac	gtt	ctg	ctg	gcg	ctc	ttc	tct	gcg	ctg	192
260	Thr	Ser	Met	Ile	Trp	Tyr	Asn	Val	Leu	Leu	Ala	Leu	Phe	Ser	Ala	Leu	
261		50			55			60									
263	agc	ttc	tac	gtg	acg	gcg	acc	gcc	ctc	ggc	tgg	gac	tat	ggt	acg	ggc	240

RAW SEQUENCE LISTING

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 265 65 70 75 80
 267 gcg tgg ctg cgc agg caa acc acc ggc gac aca ccg cag ccg ctc ttc cag 288
 268 Ala Trp Leu Arg Arg Gln Thr Gly Asp Thr Pro Gln Pro Leu Phe Gln
 269 85 90 95
 271 tgc ccg tcc ccg gtt tgg gac tcg aag ctc ttc aca tgg acc gcc aag 336
 272 Cys Pro Ser Pro Val Trp Asp Ser Lys Leu Phe Thr Trp Thr Ala Lys
 273 100 105 110
 275 gca ttc tat tac tcc aag tac gtg gag tac ctc gac acg gcc tgg ctg 384
 276 Ala Phe Tyr Tyr Ser Lys Tyr Val Glu Tyr Leu Asp Thr Ala Trp Leu
 277 115 120 125
 279 agg gtc tcc ttt ctc cag gcc ttc cac cac ttt ggc gcg ccg tgg gat 432
 280 Arg Val Ser Phe Leu Gln Ala Phe His His Phe Gly Ala Pro Trp Asp
 281 130 135 140
 283 gtc tac ctc ggc att cgg ctg cac aac gag ggc gta tgg atc ttc atg 480
 284 Val Tyr Leu Gly Ile Arg Leu His Asn Glu Gly Val Trp Ile Phe Met
 285 145 150 155 160
 287 ttt ttc aac tcg ttc att cac acc atc atg tac acc tac tac ggc ctc 528
 288 Phe Phe Asn Ser Phe Ile His Thr Ile Met Tyr Thr Tyr Tyr Gly Leu
 289 165 170 175
 291 acc gcc gcc ggg tat aag ttc aag gcc aag ccg ctc atc acc gcg atg 576
 292 Thr Ala Ala Gly Tyr Lys Phe Lys Ala Lys Pro Leu Ile Thr Ala Met
 293 180 185 190
 295 cag atc tgc cag ttc gtg ggc ggc ttc ctg ttg gtc tgg gac tac atc 624
 296 Gln Ile Cys Gln Phe Val Gly Phe Leu Leu Val Trp Asp Tyr Ile
 297 195 200 205
 299 aac gtc ccc tgc ttc aac tcg gac aaa ggg aag ttg ttc agc tgg gct 672
 300 Asn Val Pro Cys Phe Asn Ser Asp Lys Gly Lys Leu Phe Ser Trp Ala
 301 210 215 220
 303 ttc aac tat gca tac gtc ggc tcg gtc ttc ttg ctc ttc tgc cac ttt 720
 304 Phe Asn Tyr Ala Tyr Val Gly Ser Val Phe Leu Leu Phe Cys His Phe
 305 225 230 235 240
 307 ttc tac cag gac aac ttg gca acg aag aaa tcg gcc aag gcg ggc aag 768
 308 Phe Tyr Gln Asp Asn Leu Ala Thr Lys Lys Ser Ala Lys Ala Gly Lys
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 328 35 40 45
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PATENT APPLICATION: US/10/539,891 TIME: 14:01:52

Input Set : A:\Sequence Listing for 13478-00001-US.txt
Output Set: N:\CRF4\06292005\J539891.raw

Please Note:

Use of n and/or Xaa have been detected in the Sequence Listing. Please review the Sequence Listing to ensure that a corresponding explanation is presented in the <220> to <223> fields of each sequence which presents at least one n or Xaa.

Seq#:9; Xaa Pos. 106,121
Seq#:10; Xaa Pos. 106,12

Invalid Line Length:

The rules require that a line not exceed 72 characters in length. This includes spaces.

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PATENT APPLICATION: US/10/539,891 TIME: 14:01:52

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Seq#:7; Line(s) 647,648,649,650,651,652,653,654,655,656,657,658,659,660,661
Seq#:7; Line(s) 662,663,664,665,666,667,668,669,670,671,672,673,674,675,676
Seq#:7; Line(s) 677,678,679,680,681,682,683,684,685,686,687,688,689,690,691
Seq#:7; Line(s) 692,693,694,695,696,697,698,699,700,701,702,703,704,705,706
Seq#:7; Line(s) 707,708,709,710,711,712,713,714,715,716,717,718,719,720,721
Seq#:7; Line(s) 722,723,724,725
Seq#:8; Line(s) 726,727,728,729,730,731,732,733,734,735,736,737,738,739,740
Seq#:8; Line(s) 741,742,743,744,745,746,747,748,749,750,751,752,753,754,755

VERIFICATION SUMMARY

PATENT APPLICATION: US/10/539,891

DATE: 06/29/2005

TIME: 14:01:52

Input Set : A:\Sequence Listing for 13478-00001-US.txt
Output Set: N:\CRF4\06292005\J539891.raw

L:15 M:270 C: Current Application Number differs, Replaced Current Application No
L:15 M:271 C: Current Filing Date differs, Replaced Current Filing Date
L:862 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9 after pos.:336
M:341 Repeated in SeqNo=9
L:995 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:10 after pos.:96
M:341 Repeated in SeqNo=10